NASA Project Management Challenge 2009

PROJECT MANAGEMENT CHALLENGE 2009

Sixth Annual NASA Project Management Seminar

ABSTRACT AND BIOGRAPHY

Lessons From Columbia – Ballistic Impact Dynamics

On February 1, 2003, the Space Shuttle Columbia broke apart during reentry, resulting in its loss along with its seven crewmembers. For the next several months, an extensive investigation of the accident ensued involving a nationwide team of experts from NASA, industry, and academia, spanning dozens of technical disciplines. The Columbia Accident Investigation Board (CAIB), concluded that the most likely cause of the loss of Columbia and its crew was a breach in the left wing leading edge Reinforced Carbon-Carbon (RCC) thermal protection system initiated by the impact of thermal insulating foam that had separated from the orbiters external fuel tank 81 seconds into the mission's launch. During reentry, this breach allowed superheated air to penetrate the leading edge and erode the structure of left wing, resulting in the breakup of the orbiter. The findings of the CAIB were supported by ballistic impact tests, which simulated the physics of External Tank Foam impact on the RCC wing leading edge material. These tests ranged from fundamental material characterization tests to full-scale Orbiter Wing Leading Edge tests. Following the accident investigation, NASA spent 18 months returning the Shuttle safely to flight. Critical to this effort was the evaluation of all potential impact threats to the Shuttle during ascent through an extensive impact analysis and testing program. Results from the tests validated high-fidelity computer models, capable of predicting real and potential impact threats to the Shuttle, which have been used for flight certification since STS-114.

Matthew Melis
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Matthew Melis is in his 25th year as an Aerospace Engineer at the NASA Glenn Research Center. With an MS in Engineering Mechanics, and a BS in Civil Engineering, he has established a recognized expertise in static and dynamic stress analysis and ballistic impact dynamics, during his tenure at NASA. He has worked on numerous aeronautics and space programs for the Agency including Space Station, Space Shuttle, Exploration, and currently NASA's Hypersonics Program. In the four and one half years following the Columbia accident, Matt was assigned full time to working the Columbia Accident Investigation and the Shuttle Return to Flight Program as technical lead of the NASA Glenn Ballistic Impact team. Most recently, Matt has worked on landing impact testing of various design concepts for the Orion crew module and is currently involved in a high-temperature materials development effort for NASA's Hypersonics Program.

In addition to his technical work, Matt is committed to public outreach and teaching for NASA at all levels of education as well as professional groups. Since 2003, he has delivered over 70 invited lectures and keynote presentations pertaining to ballistic impact research and NASA's flight programs. Noteworthy invitations have included The National Transportation and Safety Board, Dartmouth College, The Canadian Royal Astronomical Society, Ontario Science Center, Ivey Business School, The American Institute for

Aeronautics and Astronautics, the American Society for Mechanical Engineers, the American Society for Metals, the University of Reykjavik (Iceland), and the Institute of Nuclear Power Operations.